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(71) Applicant: AMOTEK A.M. OLTREMARE S.r.l.  
I-40069 Zola Predosa (Bologna) (IT)

(72) Inventor: Cocchi, Roberto  
40069 Zola Predosa, (Prov. of Bologna) (IT)

(74) Representative: Modiano, Guido, Dr.-Ing. et al  
Modiano & Associati S.r.l.  
Via Meravigli, 16  
20123 Milano (IT)

## (54) Apparatus for vacuum packaging elastically compressible products

(57) An apparatus for packaging, in evacuated hermetic containers, products made of soft material, such as panels of foamed rubber, natural and synthetic fibers, and the like, including: a first conveyor belt (14) that is closed in a loop around a driving roller (12) and a return roller (13) and has an initial segment whereon the products (P) to be packaged, already covered by a container (F) made of airtight material, are individually positioned; and a second conveyor belt (53) that is closed in a loop around a driving roller (54) and a return roller (51). The conveyor belts have two mutually superimposed parallel sections that are actuated with a concordant motion, and the second conveyor belt comprises an articulated portion (41) that is superimposed on the initial segment and constitutes a presser

element that is actuated between a raised inclined position, which allows the positioning of each individual product between the initial segment and the portion, and a lowered position, in which the presser element compresses the product to a desired thickness and forms a guide for the advancement of the products between the superimposed sections of the first and second conveyor belts, so that the product remains compressed at the desired thickness. A heat-sealing apparatus (62,66) is arranged downstream of the presser element and along the superimposed sections of the conveyor belts to close the container hermetically.

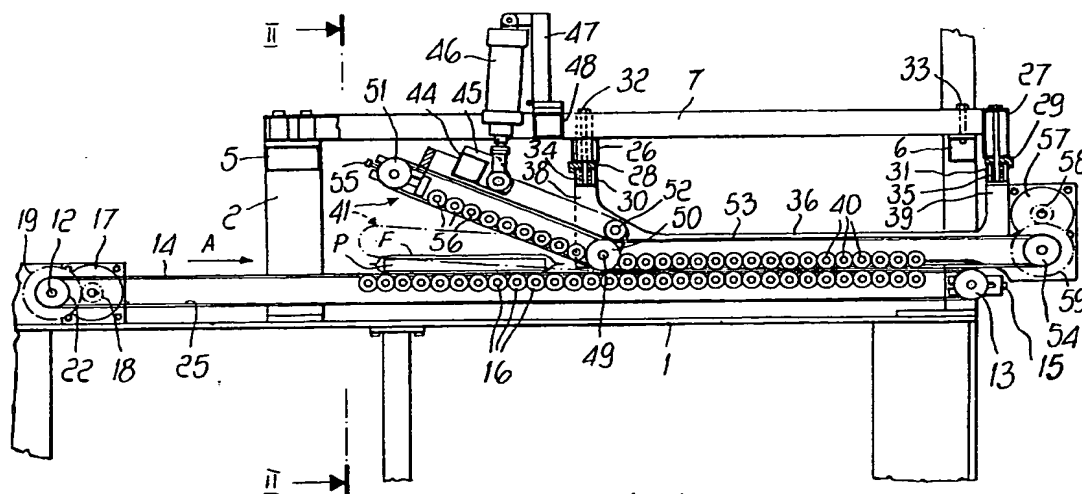


Fig. 1

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## Description

The present invention relates to an apparatus for packaging, in evacuated hermetic containers, products made of soft material having elastic compressibility features.

As used herein, the term "soft materials" relates to all those materials which, in normal pressure conditions, appear inflated due to the air trapped inside, whereas they allow air expulsion and occupy a reduced space when compressed. Materials of this type are for example foamed rubber, natural and synthetic textile fibers such as wool, cotton, cotton wool, and so forth.

In order to reduce the bulk of these materials during packaging, it has already been proposed to introduce the material in a hermetic container so that, by removing the air and closing the container hermetically, atmospheric pressure keeps the material compressed, with a significant reduction in package volume.

Currently available apparatuses for packaging the above mentioned materials are slow in operation and therefore unable to meet today's packaging requirements.

A principal aim of the present invention is therefore to provide an apparatus that is new in concept and is such as to ensure not only faster packaging but also the production of products the space occupation whereof is proportionally smaller than that conventionally obtainable.

An object of the present invention is to provide an apparatus that is highly versatile in use as to the shape and dimensions of the products to be packaged.

According to one preferred aspect of the invention, there is provided an apparatus for packaging, in evacuated hermetic containers, products made of soft material, such as panels of foamed rubber, natural and synthetic fibers, and the like, which includes: a first conveyor belt that is closed in a loop around a driving roller and a return roller and has an initial segment whereon the products to be packaged, already covered by a container made of airtight material, are individually positioned; and a second conveyor belt that is closed in a loop around a driving roller and a return roller. The conveyor belts preferably have two mutually superimposed parallel sections that are actuated with a concordant motion, and the second conveyor belt preferably comprises an articulated portion that is superimposed on an initial segment and constitutes a presser element that is actuated between a raised inclined position, which allows the positioning of each individual product between the initial segment and the articulated portion, and a lowered position, in which the presser element compresses the product to a desired thickness and forms a guide for the advancement of the products between the superimposed sections of the first and second conveyor belts, so that the product remains compressed at the desired thickness. Heat-sealing means are preferably arranged downstream of the presser ele-

ment and along the superimposed sections of the conveyor belts to close the container hermetically.

Further characteristics and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment, illustrated in the accompanying drawings and described only by way of non-limitative example, wherein:

figure 1 is a lateral elevation view of a preferred embodiment of the apparatus according to the invention; and

figure 2 is a sectional view, taken along the transverse plane II-II of figure 1.

With reference to the above figures, the apparatus comprises a base 1; two posts 2 and 3 rise vertically from a longitudinal side of the base that is parallel to the plane of figure 1, and a wall 4 rises from the opposite longitudinal side.

The posts 2 and 3 are connected to the wall 4 by cross-members 5 and 6, whereas two longitudinal members 7 and 8, which are parallel to each other and to the wall 4, are fixed to the cross-members 5 and 6. The posts 2 and 3, the longitudinal members 7 and 8, and the cross-members 5 and 6 are made of tubular profiles having a quadrangular cross-section.

A frame 9 rests on the base 1 and is constituted by two shoulders 10 and 11 that rotatably support a driving roller 12 and a return or tensioning roller 13, around which a conveyor belt 14 is closed in a loop. The roller 12 is fixed, whereas the roller 13 is movable with respect to the other roller by means of conventional adjustment screws 15 to allow the correct tensioning of the conveyor belt 14. The upper section of the conveyor belt rests on a plurality of equidistant rollers 16 distributed along the useful segment of the conveyor belt 14 that runs between the posts 2 and 3. The conveyor belt 14 is actuated in the direction A by a gearmotor 17 mounted on the base 1, on the output shaft whereof a pinion 18 is keyed; said pinion meshes with a toothed wheel 19 that is rotationally rigidly coupled to the driving roller 12.

Advantageously, each one of the rollers 12, 13, and 16 is composed of two half-rollers 20 and 21 (see figure 2) that are spaced from one another by a gap 22. The adjacent ends of the half-rollers have chamfers 23 and 24 which form a sort of pulley, around which a belt 25 wraps; said belt is fixed to the inner face of the conveyor belt 14, and its longitudinal segments lie in the gaps 22 provided between the half-rollers 20 and 21 of the rollers 16. The purpose of the belt 25 is to keep the conveyor belt 14 guided, preventing lateral movements thereof.

The longitudinal members 7 and 8 are joined to each other in a downward region approximately halfway along their length and at the ends lying downstream of the cross-member 6, respectively, by beams 26 and 27 that are welded below them and respectively on the heads of the longitudinal members 7 and 8.

Two respective bars 30 and 31 are suspended below the beams 26 and 27, with the interposition of spacers 28 and 29; like the beams 26 and 27, they are constituted by tubular profiles having a quadrangular cross-section.

The bars are fixed to the beams by means of bolts 32 and 33 that are driven through holes of the longitudinal members and of the beams and engage in threaded bushes 34 and 35 that are welded inside the bars 30 and 31.

Two side walls 36 and 37 hang from the opposite ends of the bars 30 and 31 and are parallel to the shoulders 10 and 11.

Each side wall has two arms 38 and 39 that protrude upwardly and by virtue whereof said wall is fixed to the opposite heads of the bars.

The side walls 36 and 37 support a plurality of equidistant rollers 40 which are arranged on a plane that is parallel to the plane of the underlying rollers 16.

A presser element, generally designated by the reference numeral 41, is articulated between the side walls 36 and 37, proximate to the arms 38, and comprises a frame composed of two flat and parallel walls 42 and 43 that are rigidly connected to each other by a tubular cross-member 44 that is provided, at its ends, with L-shaped elements, by virtue whereof it rests on the upper edges of the walls 42 and 43.

A flap 45 is rigidly coupled in a median position of the cross-member 44 and protrudes therefrom in a cantilevered manner; the stem of a fluid-actuated jack 46 is pivoted in said flap, and the cylinder of said jack is articulately fixed to the top of a column 47 rising from a tubular element 48 that is welded in a bridge-like fashion between the longitudinal members 7 and 8.

The pivoting axis of the presser element 41 between the side walls 36 and 37 is constituted by a shaft 49, whereon a roller 50 is rotatable; the plane of tangency of the rollers 40 is tangent to the cylindrical surface of said roller 50. A conveyor belt 53 is wound around the roller 50, a return roller 51, and a further guiding roller 52, and is closed in a loop around a driving roller 54 that is rotatably supported between the ends by the side walls 36 and 37 downstream of the bar 31.

The roller 51 is movable with respect to the roller 50 by virtue of adjustment screws 55 that allow correct tensioning of the conveyor belt 53.

The conveyor belt 53 is in tangent contact with the rollers 40 along the segment that lies between the driving roller 54 and the roller 50. Likewise, the conveyor belt 53 is in tangent contact with an additional plurality of rollers 56 along the segment that lies between the rollers 50 and 51; said rollers 56 are rotatably supported between the walls 42 and 43 of the presser element 41.

The actuation of the conveyor belt 53, similarly to the conveyor belt 14, is performed in a direction that matches the direction A and at the same speed by a gearmotor 57 associated with the side wall 36 by means of a flange.

A pinion 58 is rotationally rigidly coupled on the output shaft of the gearmotor and meshes with a gear 59 that is rotationally coupled to the roller 54.

The rollers 40, 50, 56, 51, and 54, like the rollers 16, 22, and 23, are constituted by two half-rollers to allow the passage of a driving belt that is fixed to the inside face of the conveyor belt 53.

In figure 2 of the drawing, only the half-rollers 60 and 61 that compose each roller 56 are shown; the other rollers are fully identical.

The operation of the apparatus is shown hereinafter in relation to the packaging of products P in a wrapper or container F made of plastics that is closed on three sides. The products P are constituted, for example, by a panel made of foamed rubber and are conveyed and arranged, by virtue of means that are beyond the scope of the present invention, below the presser element 41, which in this stage is in the raised position shown in figure 1.

It is also assumed that the open side of the wrapper F is orientated parallel to the direction A and directed towards the side wall 36.

When the product P is arranged below the presser element 41, the jack 46 is activated so that the product undergoes compression between the rollers 56 and 16.

Owing to the pressure applied by the rollers 16 and 56, part of the air contained in the panel P is expelled outside the wrapping. However, a considerable part of the air remains trapped in the form of compressed air, since it has not had the time to escape; if the presser element 41 were raised again, this compressed air would cause expansion of the product as a consequence of the elastic recovery of the material.

However, the actuation of the conveyor belts 14 and 53, in combination with the action of the presser element 41, causes the insertion of the product between the rollers 16 and 40 downstream of the roller 49 and the compression of the product to a thickness at which a considerable volume reduction occurs.

When the product is compressed between the rollers 16 and 40, appropriate heat-sealing means close the open side of the container, so that the product maintains its reduced volume when leaving the conveyor belts 14 and 53.

A substantial prerogative of the present apparatus is the fact that the presser element 41 does not act flatly on the product, but at an angle, so as to provide gradual air expulsion, until a wedge-shaped configuration of the product is achieved.

The oblique arrangement of the bed of rollers 56 with respect to the bed of rollers 16 provides a guide for the insertion of the product between the rollers 16 and 40. It is also particularly important that the product undergoes gradual compression even during insertion between the rollers 16 and the roller 50; said compression facilitates the further expulsion of air to reach the intended thickness, which is maintained by the rollers 16 and 40.

It is evident that the described invention perfectly achieves the intended aim and objects. In particular, it is noted that the guiding of the conveyor belt 53, performed by the roller 52, allows to keep the length of the conveyor belt 53, and therefore the traction thereof, constant during the oscillation of the presser element 41.

The apparatus has furthermore proved to be highly versatile as to the dimensions and thickness of the product and to the intended evacuation requirements. Thus, for example, it is possible to vary the distance between the conveyor belts 14 and 53, replacing the spacers 28 and 29 with others having a different gauge.

In the illustrated embodiment, the heat-sealing means are constituted by a heat-sealing bar 62 that is fixed parallel to the direction A at the top of rods 63 that are slideable in guides 64 rigidly coupled to the side wall 4. The heat-sealing bar 62 is actuated with a reciprocating motion by a lever system 65, so as to mutually lock and heat-seal the flaps of the container against a contrast element 66 that is fixed to the base. Similar heat-sealing means can also be provided on the opposite side of the conveyor belts 14 and 53 if the container of the package is tubular and therefore requires closure on two sides.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

## Claims

1. Apparatus for packaging, in evacuated hermetic containers, products made of soft material, such as panels of foamed rubber, natural and synthetic fibers, and the like, characterized in that it comprises: a first conveyor belt (14) that is closed in a loop around a driving roller (12) and a return roller (13) and has an initial segment on which the products (P) to be packaged, already covered by a container (F) made of airtight material, are individually positioned; and a second conveyor belt (53) that is closed in a loop around a driving roller (54) and a return roller (51); said conveyor belts (14, 53) having two mutually superimposed parallel sections that are actuated with a concordant motion; said second conveyor belt (53) comprising an articulated portion (41) that is superimposed on said initial segment and constitutes a presser element (41) that is actuated between a raised inclined position, which allows the positioning of each individual product (P) between said initial segment and said portion, and a lowered position, in which said presser element (41) compresses the product to a desired thickness and forms a guide for the advancement of the products between said superimposed sections of said first and second conveyor

belts (14, 53), so that said product remains compressed at the desired thickness, heat-sealing means (62, 66) being arranged downstream of said presser element (41) and along said superimposed sections of said conveyor belts to close said container (F) hermetically.

2. Apparatus according to claim 1, characterized in that said first conveyor belt (14) and said second conveyor belt (53) are wrapped around a driving roller (12; 54) and a return roller (13; 51) that are arranged so as to have two parallel and oppositely arranged sections that are in tangent contact with a plurality of co-planar rollers (16, 40).
3. Apparatus according to claim 2, characterized in that said second belt (53) is suspended from a structure (30, 31, 36, 37) the distance whereof from said first conveyor belt (14) is adjustable.
4. Apparatus according to claim 3, characterized in that said presser element (41) comprises a frame that is composed of two flat and parallel walls (42, 43) that are articulated on a shaft (49) that is supported by said structure (30, 31, 36, 37) and rotatably supports a guiding roller (50) for said second conveyor belt (53), a plurality of rollers (56) being arranged between said walls (42, 43), said return roller (51) of said second conveyor belt (53) being arranged at the free end of said frame (42, 43), said frame (42, 43) being actuated between said positions by a fluid-actuated jack (46) that is supported by said structure.
5. Apparatus according to claim 4, characterized in that it comprises a guiding roller (52) for said second conveyor belt (53) that is supported between said walls (42, 43) on a plane that passes through the articulation axis (49) of said frame (42, 43) and is perpendicular to the bed of rollers (56) supported in said frame, said guiding roller (52) being adapted to divert said compression conveyor belt (53) so that the segments of the conveyor belt that lie between said driving roller (54) and said return roller (51) are substantially parallel to each other.
6. Apparatus according to any one or more of claims 2 to 5, characterized in that said rollers (16, 40, 56) are constituted by two half-rollers (20, 21; 60, 61), between which a belt (25) is arranged, said belt being fixed to the face of the conveyor belts in tangent contact with the rollers, said belt being wrapped in a loop around a sort of pulley that is constituted by chamfers (23, 24) formed at the adjacent ends of the half-rollers (20, 21; 60, 61) that compose said driving roller (12, 54) and said return roller (13, 50, 51).

7. Apparatus for vacuum packaging elastically compressible products, comprising:  
a first conveyor belt (14) for receiving and movably supporting a product; and  
a second conveyor belt (53) arranged adjacent to said first conveyor belt such that a product may be movably supported between said first and second conveyor belts in order to compress the product therebetween;  
said second conveyor belt comprising a pivoting portion which pivots with respect to an initial portion of the first conveyor belt; the apparatus further comprising:  
a pusher device connected to said pivoting portion for pivoting said pivoting portion relating to said initial portion.
8. The apparatus of claim 7, characterized in that said first and said second conveyor belts each comprise downstream portions which are mutually relatively fixedly arranged downstream with respect to said initial and pivoting portions.
9. Apparatus for packaging, in evacuated hermetic containers, products made of soft material having elastic compressibility features, according to what can be deduced from the description and from the drawings.

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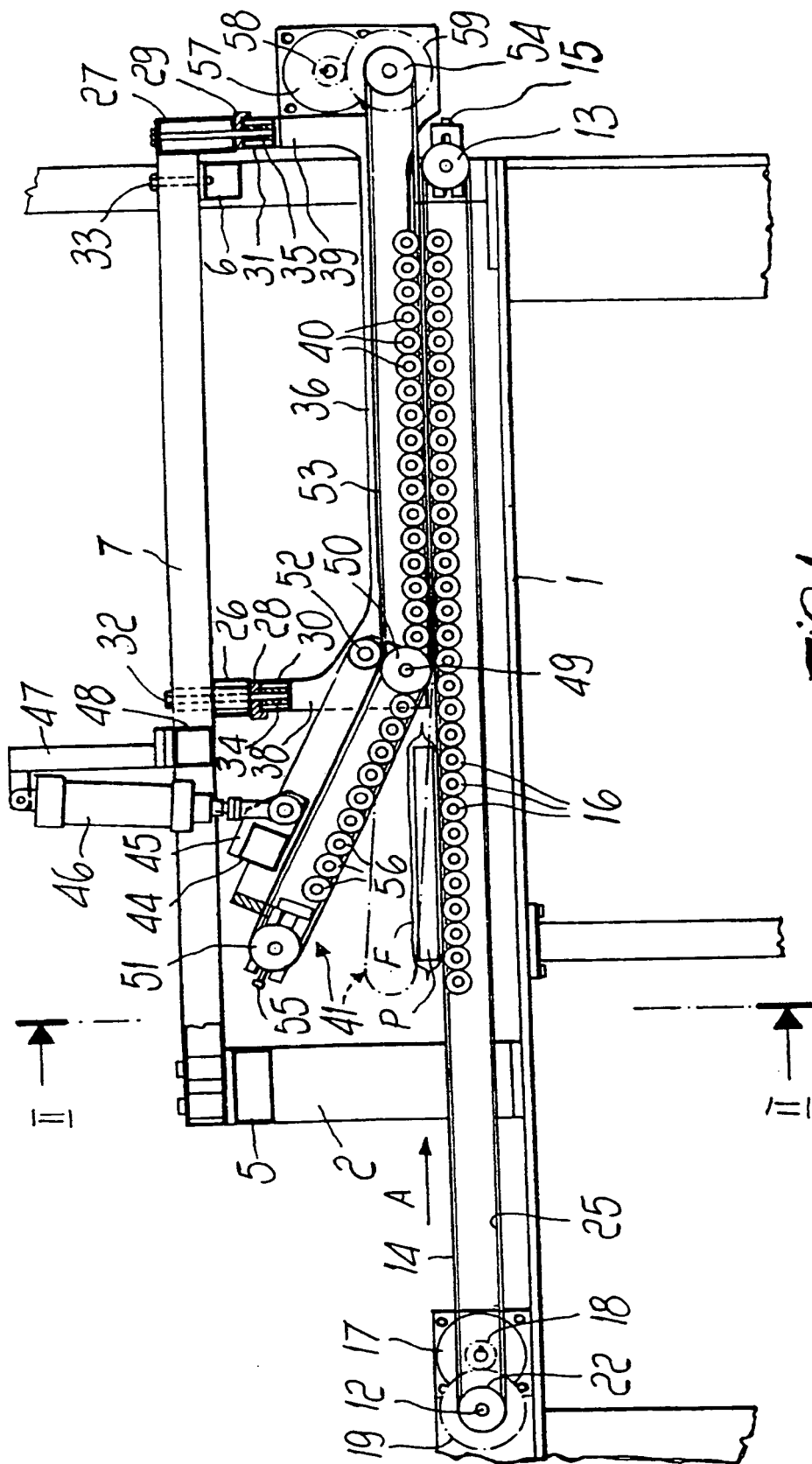


FIG. 1

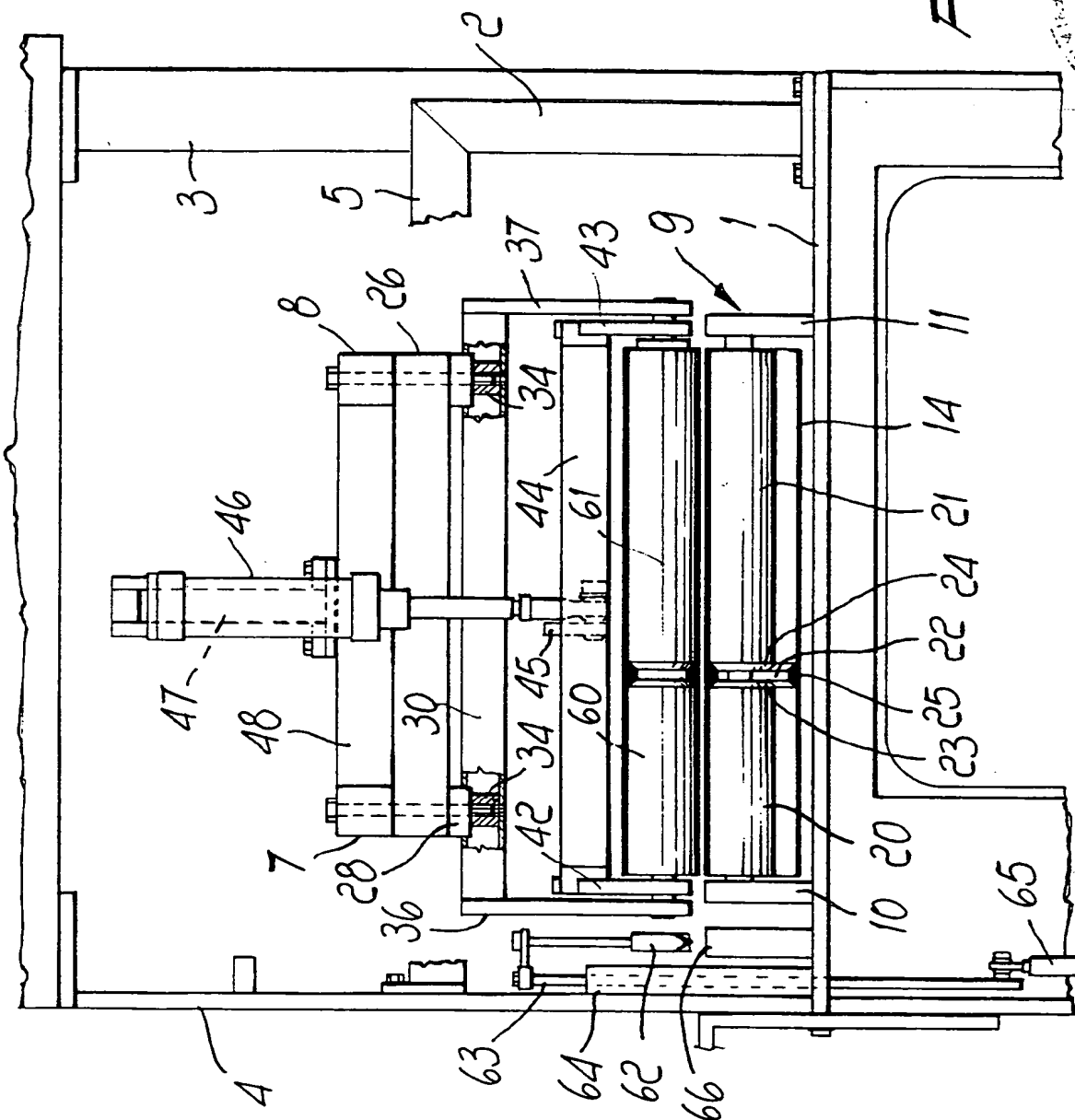
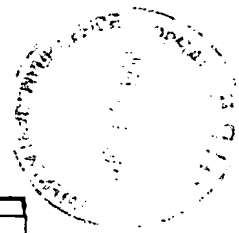


Fig. 2



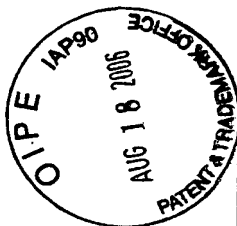


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## PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 96 10 3386  
shall be considered, for the purposes of subsequent  
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CL.6)
A	DE-A-34 07 006 (BAYER) 29 August 1985 * page 6, line 8 - page 7; figures 1-3 * * page 9, paragraph 2; figure 7 *	1,7,8	B65B63/02
A	FR-A-2 219 064 (JOHNS-MANVILLE CORP.) 20 September 1974 * claim 8; figure 1 *	1,7,8	
A	FR-A-2 532 275 (O.E. GUSTAVSSON) 2 March 1984 * figures 2,3 *	2	
A	EP-A-0 195 755 (G. MAGNI) 24 September 1986 * page 8, line 3-22; figure 1 *	1,7	
			TECHNICAL FIELDS SEARCHED (Int.CL.6)
			B65B
INCOMPLETE SEARCH			
<p>The Search Division considers that the present European patent application does not comply with the provisions of the European Patent Convention to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of some of the claims</p> <p>Claims searched completely : 1-8 Claims searched incompletely : Claims not searched : 9 Reason for the limitation of the search:</p> <p>Article 84/ Rule 29 (6) EPC</p>			
Place of search		Date of completion of the search	Examiner
THE HAGUE		17 June 1996	Greutzius, W
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